

## CLAIMS

- 1    1.    A magnetic memory cell comprising:  
2        a first magnetic layer;  
3        a second magnetic layer; and  
4        a nonmagnetic spacer layer disposed between the first and second layers for  
5 coupling the first and second layers to be parallel in zero field.
- 1    2.    The magnetic memory cell of claim 1 wherein the first layer is thicker than the  
2        second layer.
- 1    3.    The cell of claim 1 wherein the first and second layers have substantially equal  
2        thicknesses.
- 1    4.    The cell of claim 2 wherein the first layer is thicker than the second layer by a  
2        factor of two or more.
- 1    5.    The cell of claim 4 wherein the first layer is thicker than the second layer by a  
2        factor of two or more and no greater than six.
- 1    6.    The cell of claim 1 wherein the coupling is strong enough to couple the layers  
2 in parallel when they point in easy direction and weak enough so that the layers are  
3 coupled non-parallel when the layers point in the hard axis direction.

- 1 7. The cell of claim 1 wherein the nonmagnetic spacer layer comprises one of an  
2 element or alloy that provides an amount of exchange coupling that results in  
3 antiparallel switching of logic state.
- 1 8. The cell of claim 7 wherein the element or alloy comprises one of the group  
2 consisting of Ru, Os, Re, Rh, Mo, Ir, Cr, Cu, and V.
- 1 9. The cell of claim 1 wherein the nonmagnetic spacer layer comprises a spacer  
2 material for providing a very large parallel coupling and a dusting layer for  
3 reducing the coupling.
- 1 10. The cell of claim 9 wherein the spacer material comprises a Ru layer.
- 1 11. The cell of claim 10 wherein at least one of the surfaces of the Ru layer is  
2 dusted with another material for reducing the coupling between the first and  
3 second magnetic layers.
- 1 12. The cell of claim 1 wherein the two magnetic layers separated only by a thin  
2 layer of a nonmagnetic material comprising pinholes.
- 3 13. The cell of claim 6 wherein the coupling is weak enough to couple the layers  
4 anti-parallel when the layers point in the hard axis direction.

- 1 14. A cell for coupling a first magnetic layer to a second magnetic layer  
2 comprising:  
3 introducing a nonmagnetic layer disposed between the first and second  
4 magnetic layers for coupling the first and second layers to be parallel in zero field.  
5
- 6 15. The method of claim 14 further comprising providing first and second layers  
7 having substantially equal thicknesses.
- 1 16. The method of claim 14 further comprising providing first and second layers  
2 wherein the first layer is thicker than the second layer by a factor of two or more.
- 1 17. The method of claim 14 further comprising providing a first layer that is  
2 thicker than the second layer by a factor of two or more and no greater than six.
- 1 18. The method of claim 14 further comprising providing a coupling that is strong  
2 enough to couple the layers in parallel when they point in easy direction and weak  
3 enough so that the layers are coupled anti-parallel when they point in the hard axis  
4 direction.
- 1 19. The method of claim 14 further comprising providing a nonmagnetic spacer  
2 layer that comprises one of an element or alloy that provides an amount of exchange  
3 coupling that results in antiparallel switching of logic state.

1 20. The method of claim 14 further comprising providing a nonmagnetic spacer  
2 layer that comprises a spacer material which gives very large parallel coupling and a  
3 dusting layer for reducing the coupling.

1 21. The method of claim 14 further comprising providing a Ru layer dusted with a  
2 few Angstroms of another material that produces a much smaller coupling for  
3 reducing the coupling between the first and second magnetic layers.